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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/502,461	01/06/2005	Y. T. L. Yang	049411-0238	3993
22428 7590 05/30/2008 FOLEY AND LARDNER LLP SUITE 500 3000 K STREET NW WASHINGTON, DC 20007				
EXAMINER				
ARENA, ANDREW OWENS				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/502,461

Applicant(s)

YANG ET AL.

Examiner

Andrew O. Arena

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 February 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-83 is/are pending in the application.
- 4a) Of the above claim(s) 19-83 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- Paper No(s)/Mail Date _____

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of Group I, claims 1-18, in the reply filed on 05/07/2007 is acknowledged.

Claims 19-83 are withdrawn from further consideration per 37 CFR 1.142(b) as being drawn to nonelected inventions, there being no allowable generic or linking claim.

Claim Rejections - 35 USC § 103

Claims 1-9, and 13-18 are rejected under 35 U.S.C. 103(a) as being obvious in view of Westervelt (US 5,663,507) and Nguyen (US 5,976,994).

RE claim 1, Westervelt discloses a monolithically fabricated (col 3 ln 18-20) apparatus comprising (e.g., Fig 3):

a doubly clamped (col 1 ln 12-13), suspended beam with a submicron width (col 3 ln 21-22, col 5 ln 17-18, col 7 ln 34-36, col 7 ln 40) defined between a first side and a second side of the beam, the beam having an asymmetrically (arbitrary axis) positioned (13 asymmetrically positioned in 12; col 5 ln 3-6), mechanical-to-electrical transducing layer (13; col 4 ln 67) fabricated asymmetrically within a thickness of the beam or on the beam (col 3 ln 23-27).

Westervelt differs from the claimed invention only in not disclosing a side gate.

Nguyen discloses (e.g., Fig 1) an analogous apparatus comprising a doubly-clamped suspended beam (14; col 4 ln 36) and at least one side drive gate (16; col 4 ln 36) proximate to the beam within a distance smaller than a width of the beam (Fig 1).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that, in view of Nguyen, the apparatus of Westervelt further comprise at least one side drive gate located within a submicron distance to the first of the second side of the beam; at least to enable driving and sensing of the beam.

Since the beam of Westervelt is of submicron width and the drive gate of Nguyen is spaced from the beam by less than the beam width, the combination relied upon would include said side drive gate proximate to the beam within submicron distance.

If factual evidence is made of record which establishes that the combination does not include said limitation, then said limitation is obvious based on the following.

Westervelt teaches improvements in sensitivity and performance with decreasing size (col 2 ln 30-32, col 3 ln 20-22, col 3 ln 38-41, col 7 ln 34-46).

One of ordinary skill in the relevant art would, of necessity, understand that drive and sense gates operate by capacitance and that capacitance is increased with decreasing proximity of capacitance plates. See MPEP § 2141.03 citing to Hiyamizu.

RE claim 2, Westervelt discloses the mechanical-to-electrical transducing layer comprises a piezoelectric layer asymmetrically positioned within the thickness of the beam (col 3 ln 17-27).

RE claim 3, Westervelt discloses the beam is fabricated from a 2 DEG heterostructure (col 4 ln 27-32).

RE claims 4 & 5, official notice is taken that the claimed circuit connections are conventional and obvious as known for providing predictable results. See cited art.

RE claims 6, 13 & 14, the combined apparatus discloses the claimed structure, the claimed dipole-to-dipole property is presumed inherent. See MPEP § 2112.01(I).

RE claims 6, 8, 13 & 14, the combined apparatus differs from the claimed invention only in not expressly disclosing the material of the side gate.

One of ordinary skill in the relevant art would, of necessity, understand that such devices are usually monolithically fabricated from a single substrate and that the side drive gates are therefore formed from the same materials as the beam itself.

Furthermore, Westervelt desires integration (col 3 ln 23-27).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that the side gate is formed from the same material as the beam; at least to simplify manufacture / increase process integration.

The combined device includes the claimed composition, it must have the claimed dipole-to-dipole properties. See MPEP § 2112.01(II).

RE claim 7, Westervelt discloses cryogenic means for maintaining the beam at cryogenic temperatures (col 6 ln 3-5).

RE claim 9, the combined apparatus of Westervelt and Nguyen discloses the beam and side gate comprise a chip and further comprise a substrate (11 in Fig 1 of Westervelt; 22 in Fig 2 of Nguyen), the substrate having an electrode formed thereon (substrate of Westervelt conductive, col 4 ln 54, upper surface regarded as electrode); the claimed dipole charge separation and interactions presumed inherent.

RE claim 15, Westervelt discloses a source of sensing current (29; col 5 ln 39) supplied to the beam and an amplifier (30; col 3 ln 45) in circuit with the beam to generate an output signal (col 3 ln 48).

RE claim 16, Westervelt discloses the amplifier is cryogenic (interpreted as per MPEP § 2111 to encompass that of Westervelt, especially see col 6 ln 3-5).

RE claim 17, the combination of Westervelt and Nguyen discloses the claimed apparatus. See MPEP § 2114. Further, Westervelt discloses a source of sensing current which is capable of the intended use recited in the claim.

RE claim 18, Westervelt discloses the transducing layer of the beam is piezoelectric (col 4 ln 29) and piezoresistive (same material inherently has claimed properties; also col 5 ln 46-47) and is capable of the intended use recited in the claim.

Claims 10-12 are rejected under 35 U.S.C. 103(a) as being obvious in view of Westervelt and Nguyen as applied to claim 1 above, and further in view of Blick (Phys. Rev. B, Vol.62, No.24, Pg.17103).

RE claims 10-12, Westervelt discloses that any suitable materials may be used (col 2 ln 49-53, col 4 ln 57-60, col 8 ln 16-21).

The combined apparatus differs from the claimed invention only in not expressly disclosing the claimed asymmetric heterostructure stack.

Blick is analogously directed at suspended 2DEGs and teaches the claimed asymmetric heterostructure stack, limitations of claims 10-12 (pg 17103 col 1 ln 26-36).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that, in view of Blick, the combined apparatus have:

the beam and gate fabricated from an asymmetric heterostructure stack comprising a 2 DEG GaAs piezoelectric layer, two sandwiching AlGaAs spacer layers on each side of the GaAs layer, a first and second AlGaAs: Si donor layer above and below the AlGaAs spacer layers respectively, two GaAs cap layers above and below the AlGaAs: Si donor layers respectively;

each of the layers below the 2DEG GaAs piezoelectric layer is thicker than the corresponding layer above the 2 DEG GaAs piezoelectric layer; and

an $\text{Al}_x\text{Ga}_{1-x}\text{As}$ sacrificial layer disposed under the stack and a substrate disposed under the $\text{Al}_x\text{Ga}_{1-x}\text{As}$ sacrificial layer, where $0 < x < 1$;

at least to utilize known suitable materials. See MPEP § 2144.06-2144.07.

Response to Arguments

Applicant's arguments filed 02/12/2008 have been fully considered but they are not persuasive.

The arguments against the submicron width are not convincing. As admitted in the present reply (pg 23 ¶1), Westervelt discloses a submicron device; the width is one of the smallest dimensions of the device (Fig 2-3, length 22 in Fig 2, col 5 ln 11).

The recitation "submicron" is not specifically defined and nothing in the claim language precludes it's reading onto the disclosure of Westervelt. Applicant is free to amend the claim language to avoid the applied art, but new matter will not be entered.

The recitation "assymetrically positioned" is not specifically defined and nothing in the claim language precludes it's reading onto the disclosure of Westervelt.

Furthermore, the FET is located at one end of the beam's length, which is asymmetric with respect to the length; the claim language reads on the applied art.

The FET must be formed "within a thickness of the beam"; Westervelt explicitly shows FET 13 (Fig 3) having a source and drain in the beam (Fig 2), it is known in this art that a source a drain are impurity regions formed within a thickness of the substrate.

The argument of non-analogy (pg 25) is not convincing. Both Westervelt and Nguyen pertain to MEMS beams. The device of Westervelt functions by detecting strain caused by displacement (e.g., col 2 ln 30, col 3 ln 38-41) which is an extremely sensitive measurement (e.g., col 7 ln 34-52) and which would clearly benefit from a precise tuning and calibration, which is the object of Nguyen (e.g., abstract).

The argument of proximity (pg 27) is not convincing. Nguyen shows drive gates (16, 18) of a size of order of the beam and in very close proximity to the beam (14), in fact, the proximity is clearly smaller than the width of the beam. One of ordinary skill must appreciate that the gates function based on close proximity. If such gates were used on the submicron beam of Westervelt, they would have to be shrunk and be located within a submicron distance of said submicron beam.

Conclusion

The prior art made of record (in the action dated 09/12/2007) and not relied upon is considered pertinent to applicant's disclosure.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew O. Arena whose telephone number is 571-272-5976. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on 571- 272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. For more info about PAIR, see <http://pair-direct.uspto.gov>. For questions PAIR access, contact the Electronic Business Center at 866-217-9197 (toll-free). For assistance from a USPTO Customer Service Rep or access to the automated info system, call 800-786-9199 or 571-272-1000.

/Lynne A. Gurley/
Supervisory Patent Examiner, Art Unit 2811

/Andrew O. Arena/
Examiner, Art Unit 2811
27 May 2008